MISSION CE CLIMATE TRAINING II:

Addressing Climate Challenges and Enhancing Adaptation Strategies

Jan 23th, 2024

Focus area: Temperature-based climate risks

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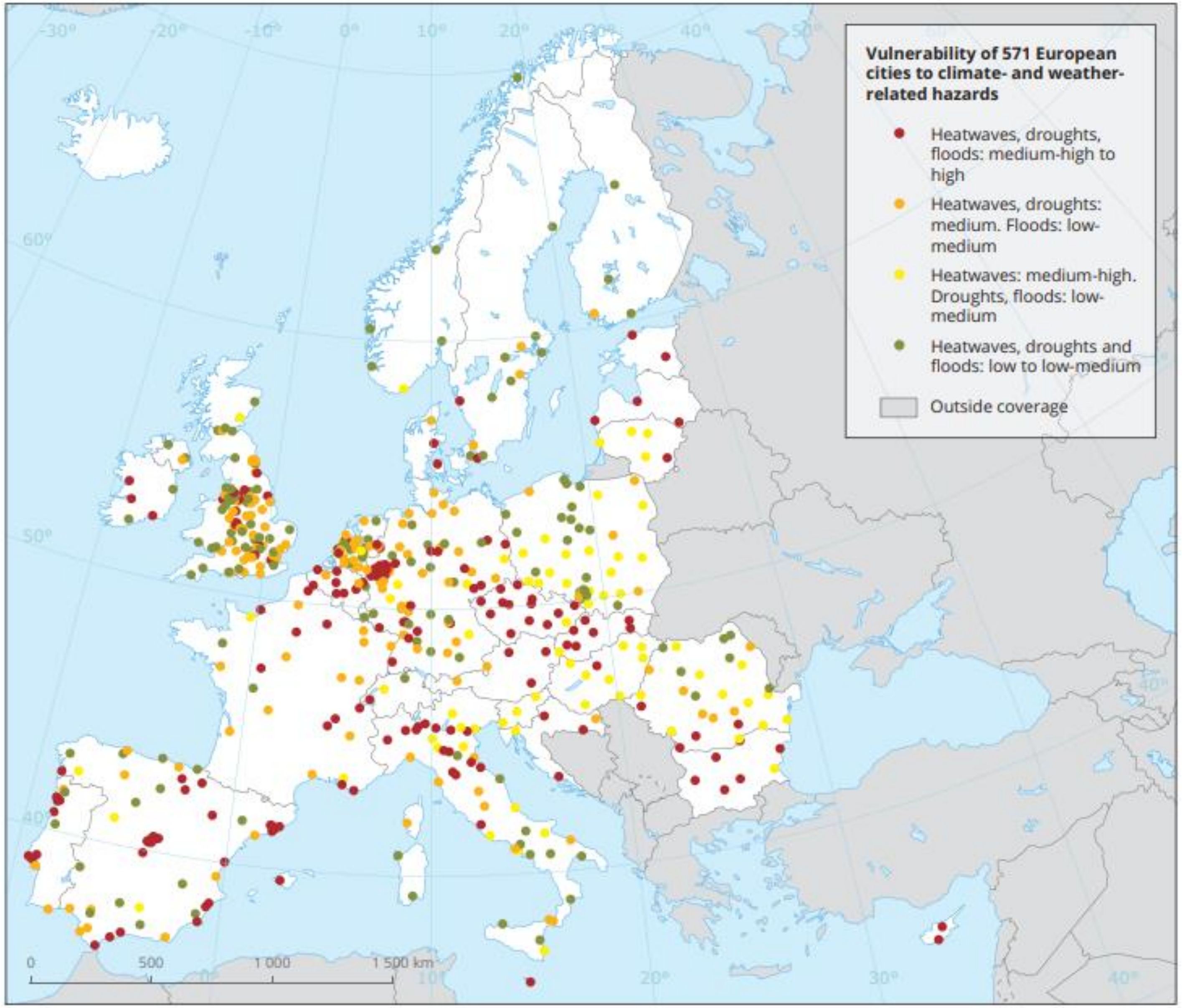
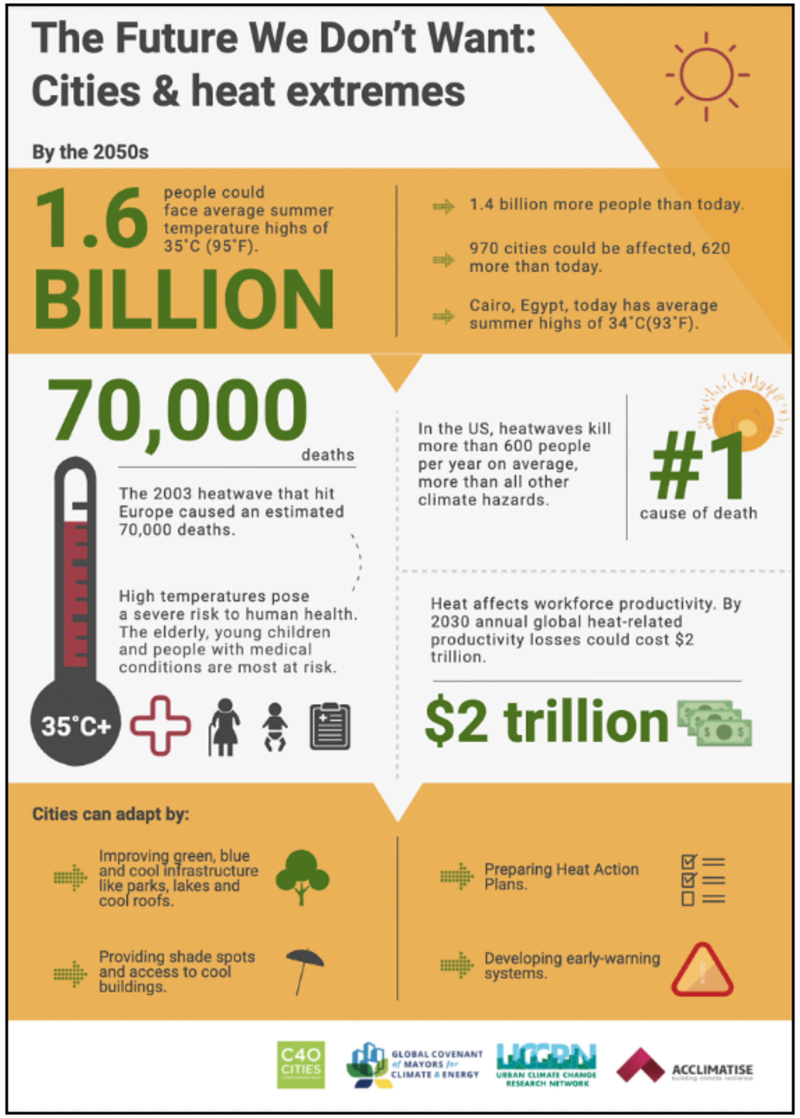


Reference data: ©ESRI

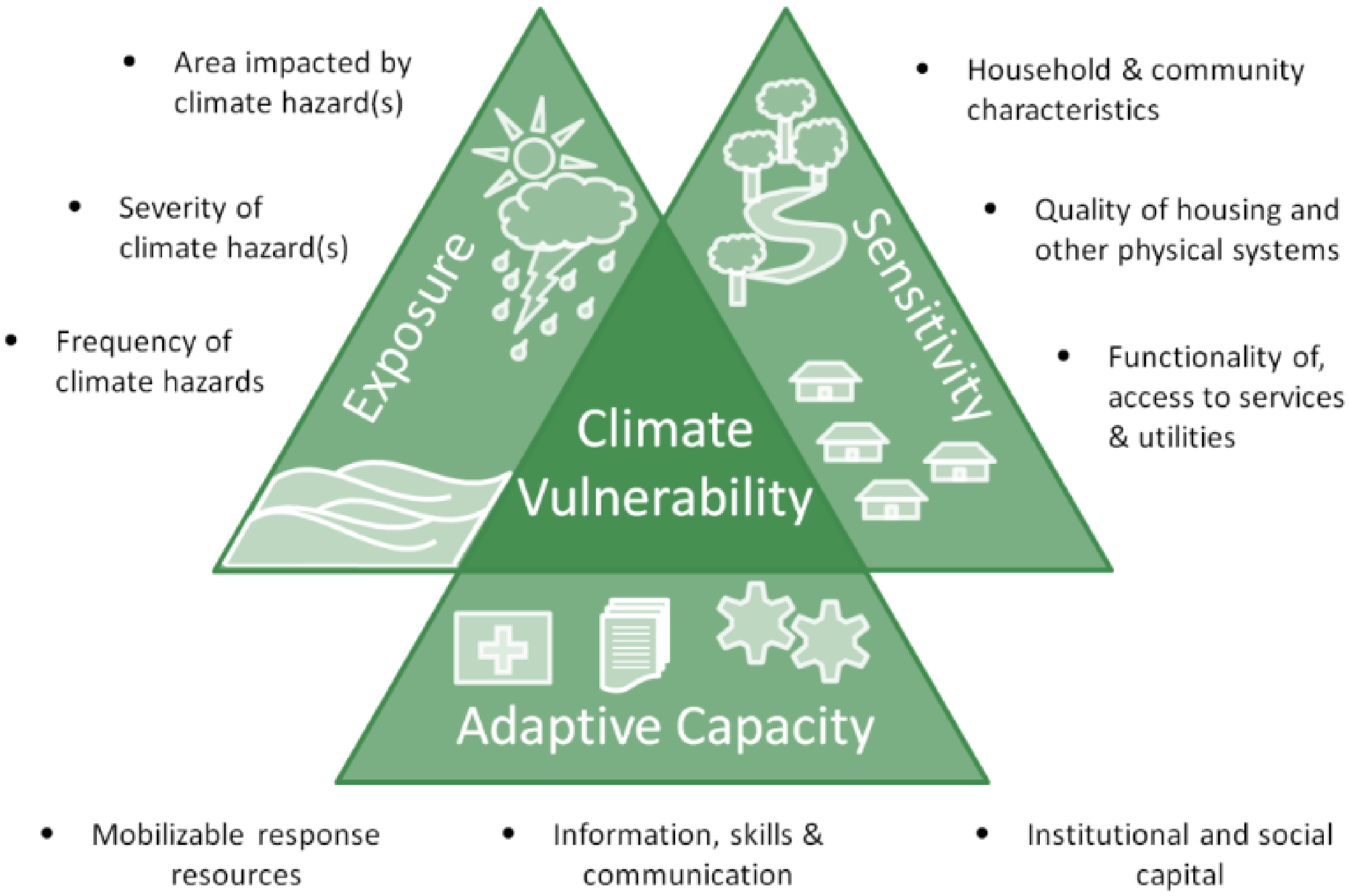
Note: Based on investigation into 571 European cities included in the Geographic Information System of the Commission Urban Audit 2004 Database. The information on individual cities included in this analysis, following the original classification into seven clusters, is available through the Urban Adaptation Map Viewer (factsheets).

Source: Adapted from Tapia et al. (2017).



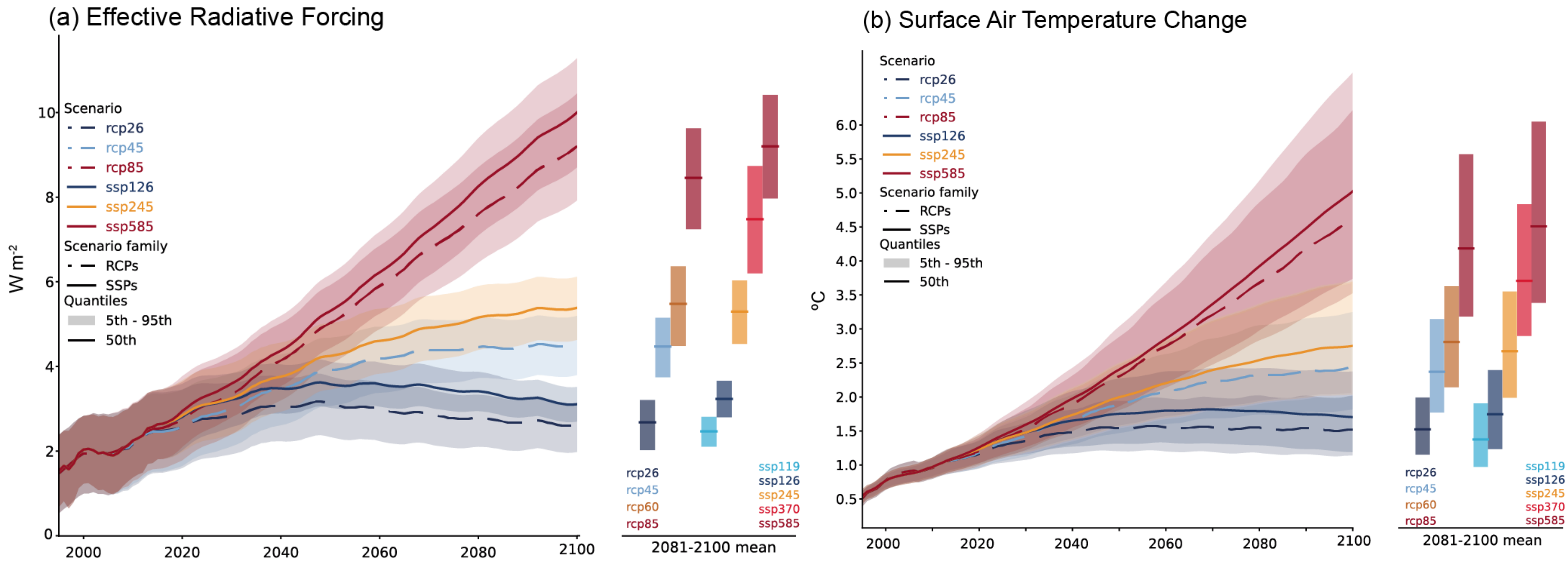
https://www.c40.org/what-we-do/scaling-up-climate-action/adaptation-water/the-future-we-dont-want/heat-extremes/

Vir: EEA, 2020



Area impacted by climate hazard(s)
Severity of climate hazard(s)
Frequency of climate hazards
Exposure
Household & community characteristics
Quality of housing and other physical systems
Functionality of, access to services & utilities
Sensitivity
Climate Vulnerability
Adaptive Capacity
Mobilizable response resources
Information, skills & communication
Institutional and social capital

UN habitat



(a) Effective Radiative Forcing
W m-2
Scenario
rcp26
rcp45
rcp85
ssp126
ssp245
ssp585
Scenario family
RCPs
SSPs
Quantiles
5th - 95th
50th
0
2
4
6
8
10
2000
2020
2040
2060
2080
2100
rcp26
rcp45
rcp60
rcp85
ssp119
ssp126
ssp245
ssp370
ssp585
2081-2100 mean
(b) Surface Air Temperature Change
°C
Scenario
rcp26
rcp45
rcp85
ssp126
ssp245
ssp585
Scenario family
RCPs
SSPs
Quantiles
5th - 95th
50th
0.5
1.0
1.5
2.0
2.5
3.0
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4.0
4.5
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5.5
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2000
2020
2040
2060
2080
2100
rcp26
rcp45
rcp60
rcp85
ssp119
ssp126
ssp245
ssp370
ssp585
2081-2100 mean

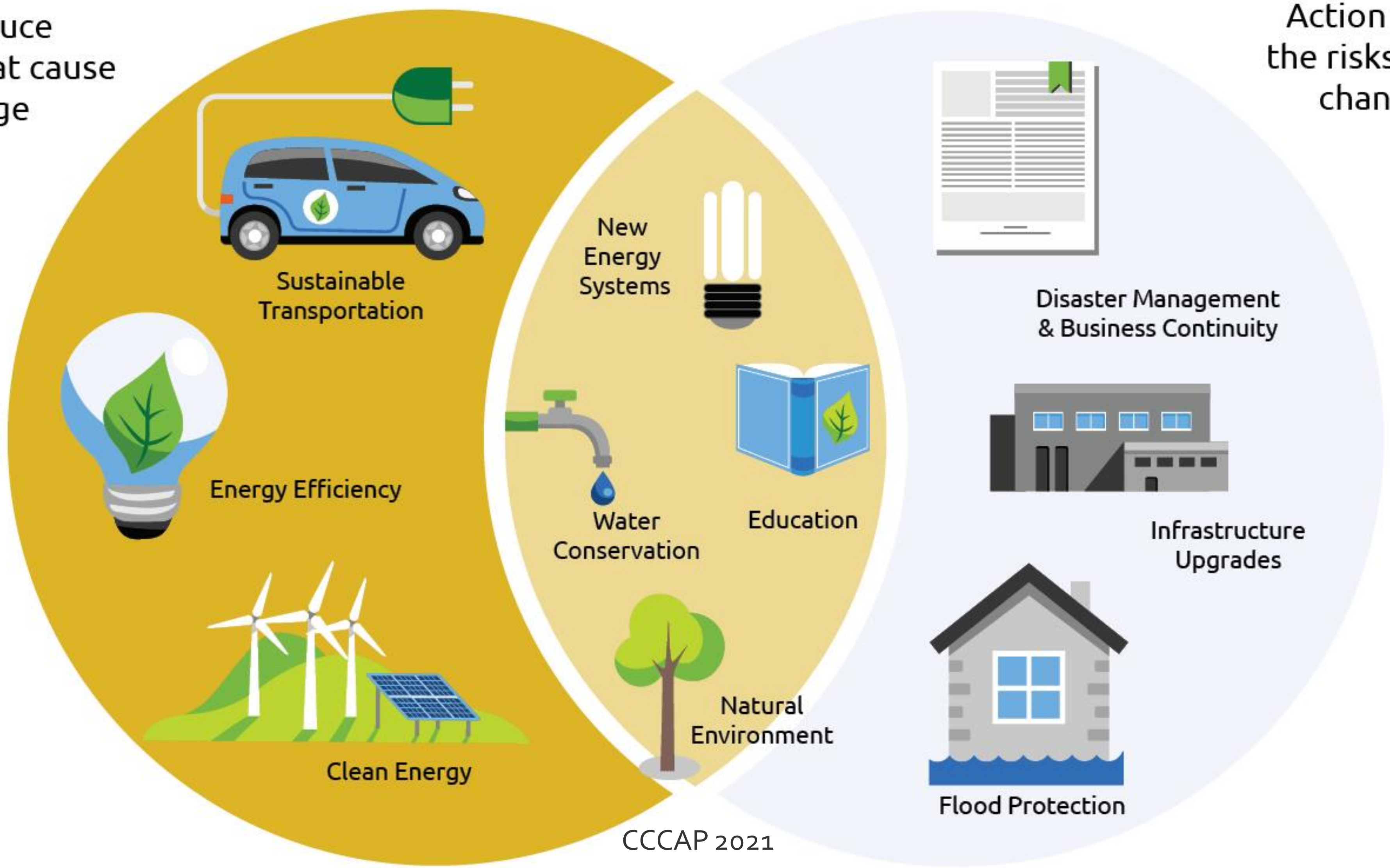
SSP	RCP(s) associated with SSP	End of century CO2 ppm	Description
SSP1	RCP 1.9 RCP 2.6	~390 ---	Sustainability: The world shifts gradually, but pervasively, toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries.
SSP2	RCP 4.5	---	Middle of the road: The world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns.
SSP3	RCP 7.0	---	Regional rivalry: A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues.
SSP4	RCP 3.4	---	Inequality: Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to increasing inequalities and stratification both across and within countries.
SSP5	RCP 8.5	~1130	Fossil-fueled development: This world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development. Global markets are increasingly integrated.

Mitigation

Action to reduce emissions that cause climate change

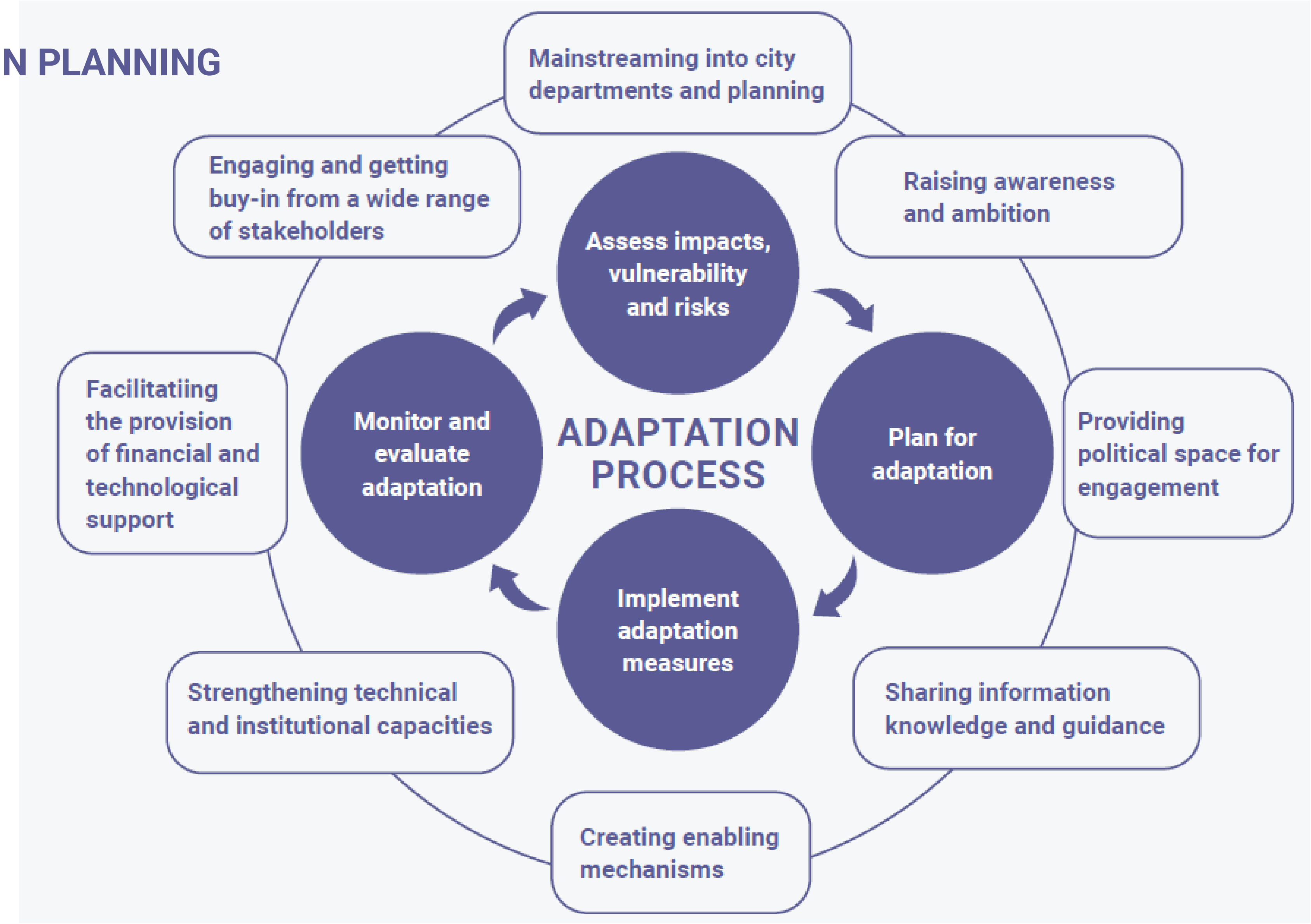
Adaptation

Action to manage the risks of climate change impacts



CCCAP 2021

ADAPTATION PLANNING



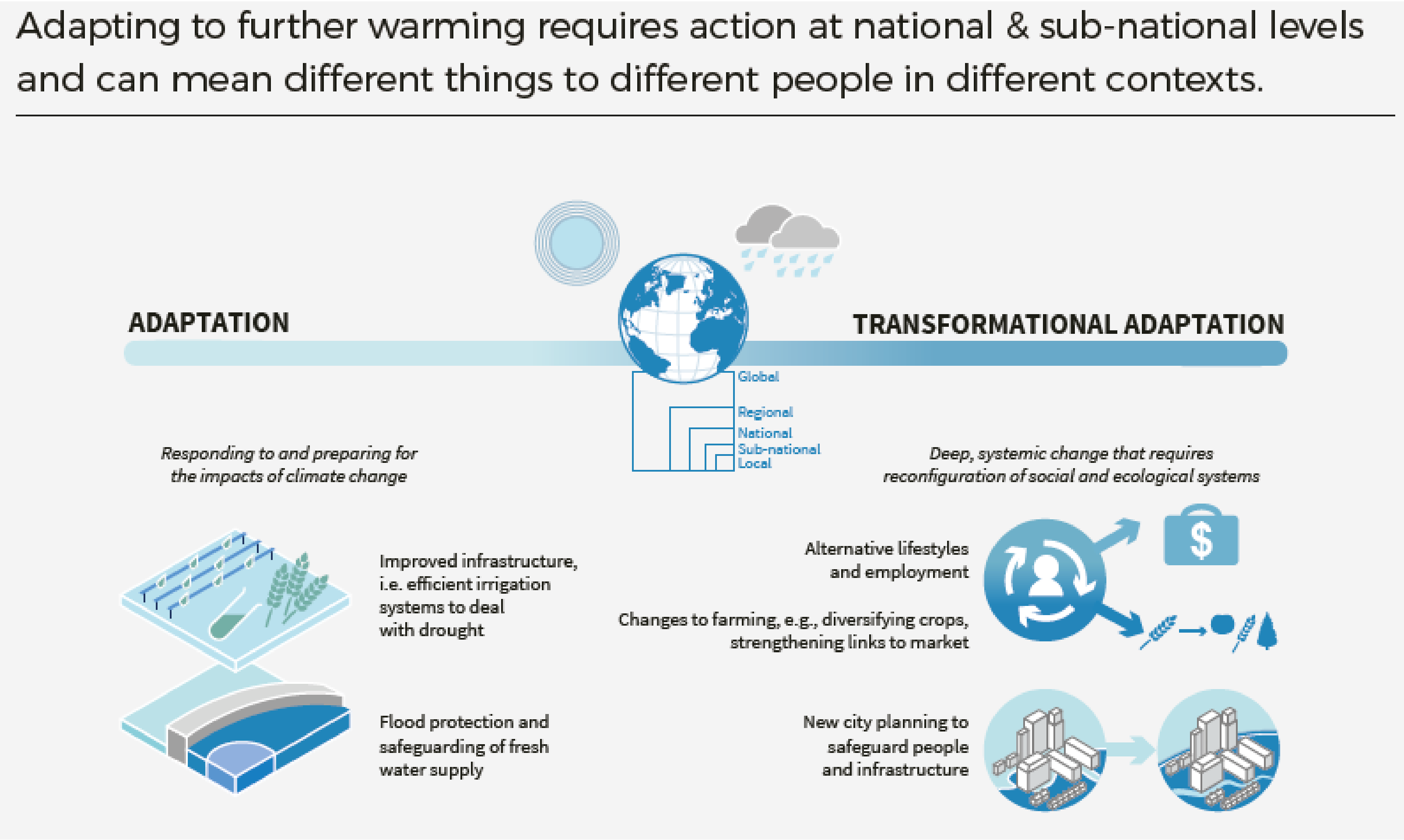
Climate risk and vulnerability assessment - Training guide for cities, CDP 2022

EMBEDDING CLIMATE ACTION INTO POLICY AND GOVERNANCE

Four key enablers for mainstreaming urban climate action:

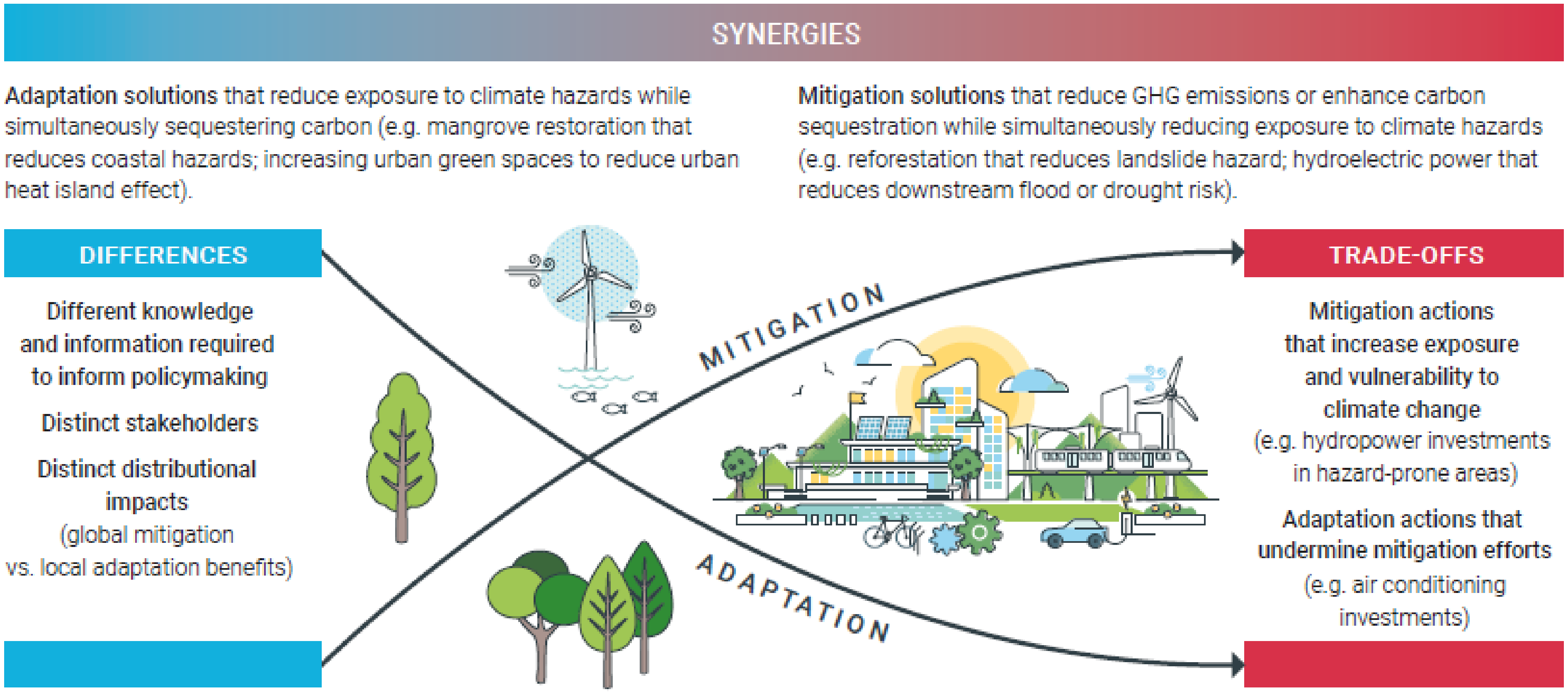
	POLICY AND REGULATORY FRAMEWORKS	PLANS AND PROGRAMS	INSTITUTIONAL STRUCTURES	GOVERNANCE MECHANISMS
Examples:	- Policies, laws, bylaws, development regulations and guidelines which mandate, incentivize or prioritise climate action. - Integrate climate change into applicable existing policies, bylaws, regulations and guidelines.	- Technical support and capacity building programmes for cities and private sector partners. - Infrastructure plans that incorporate climate action. - Financial incentives and funding for city climate action.	- Clear roles, climate change mandates and incentives for different departments and levels of government. - Participatory approaches to decision-making.	- Systems that help cities collect and manage data, and utilize it for effective climate-related decision making e.g. CRVA and adaptation planning. - Apply a climate lens to all existing processes, e.g., building consents.

Climate risk and vulnerability assessment - Training guide for cities, CDP 2022



Adaptation Gap Report 2022: Too Little, Too Slow (2022)
https://www.unep.org/resources/adaptation-gap-report-2022

Figure ES.6 Aligning climate change mitigation and adaptation action: differences, synergies and trade-offs



Adaptation Gap Report 2022: Too Little, Too Slow (2022)

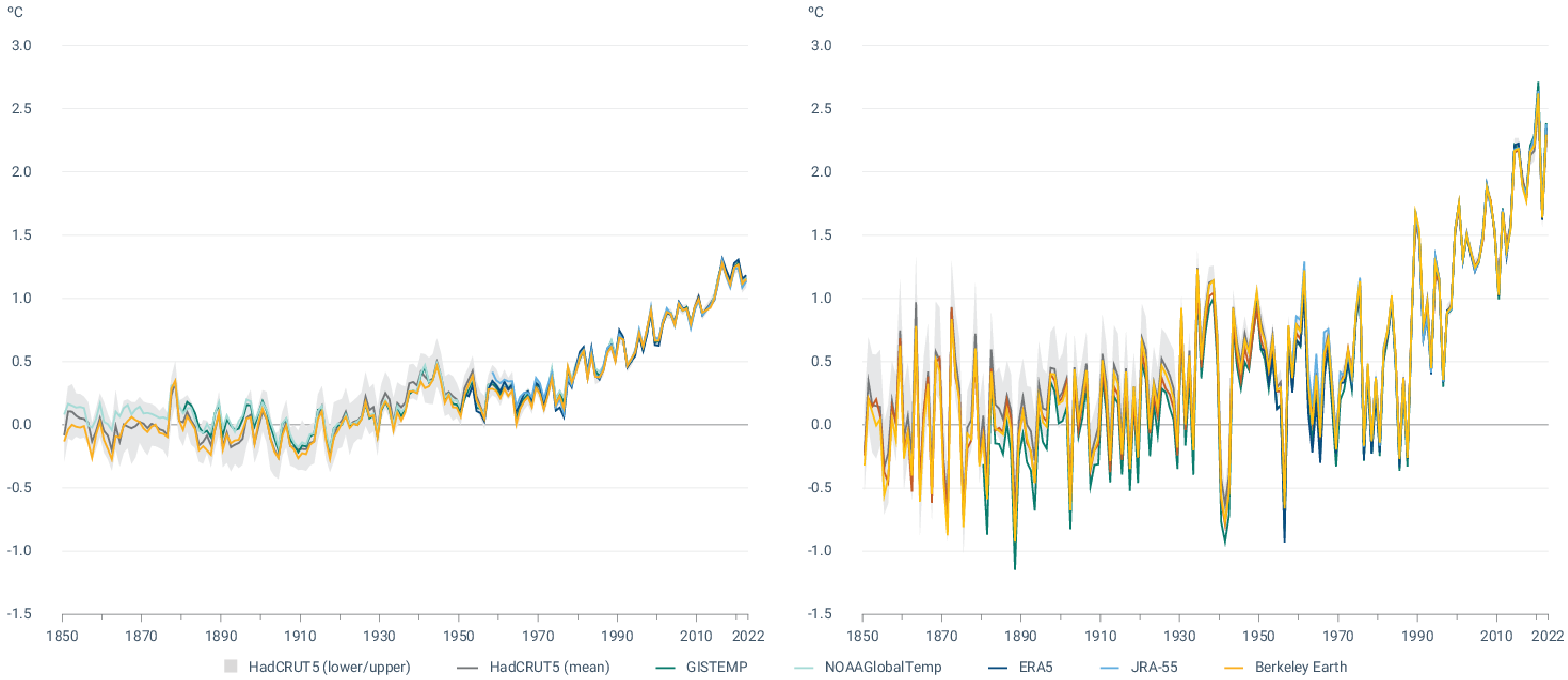
Considering interlinkages of adaptation and mitigation action from the outset in planning, finance and implementation can enhance co-benefits.

Figure ES.5 An 'architecture' of risk reduction, including principles, actions and outcomes that can be used as a basis for assessing actual or likely adaptation effectiveness

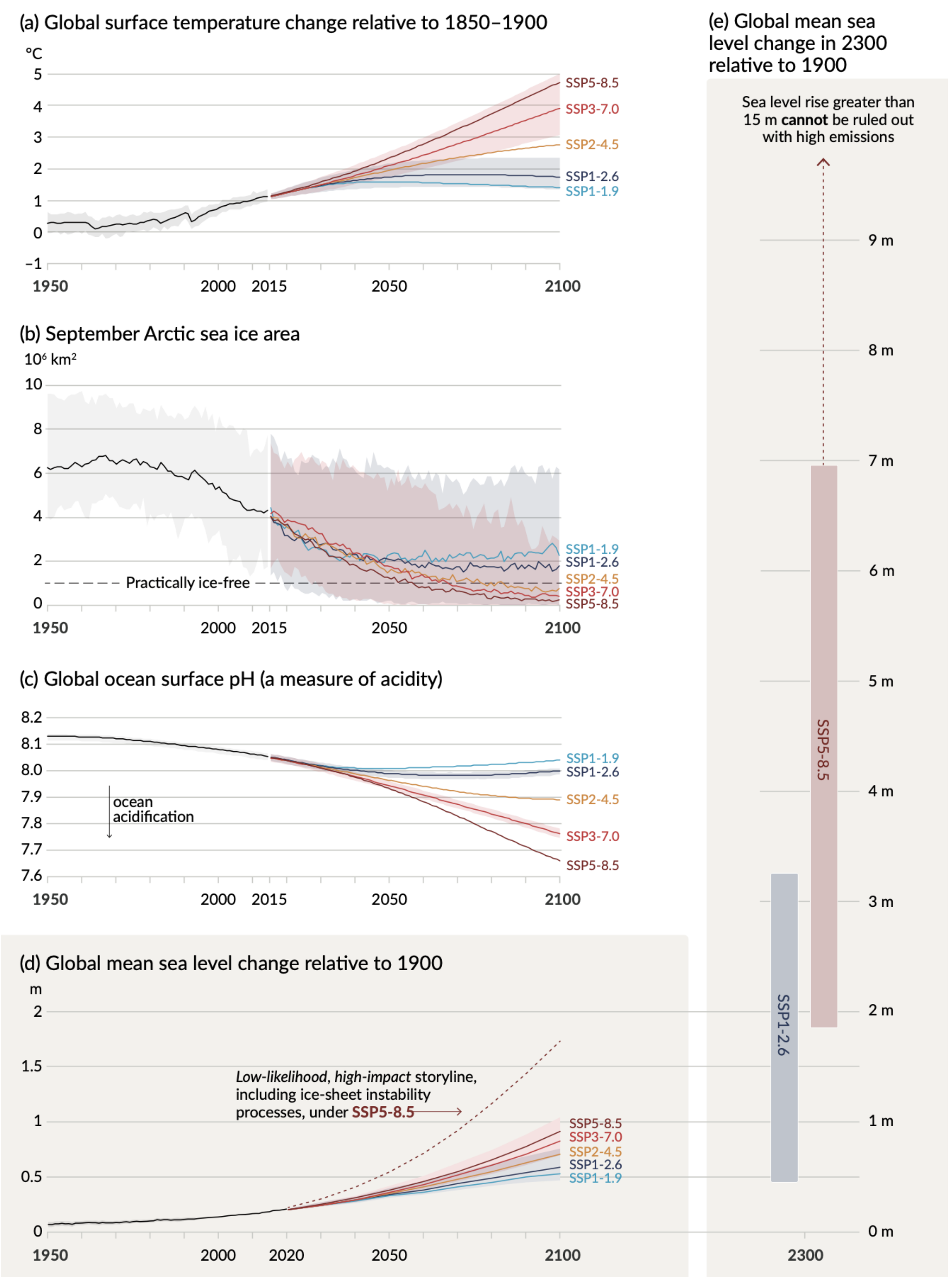
Adaptation Gap Report 2022: Too Little, Too Slow (2022)

Historical temperature trends and climate projections for Central Europe

Global (left) and European (right) annual average near-surface temperature anomalies relative to 1850-1900

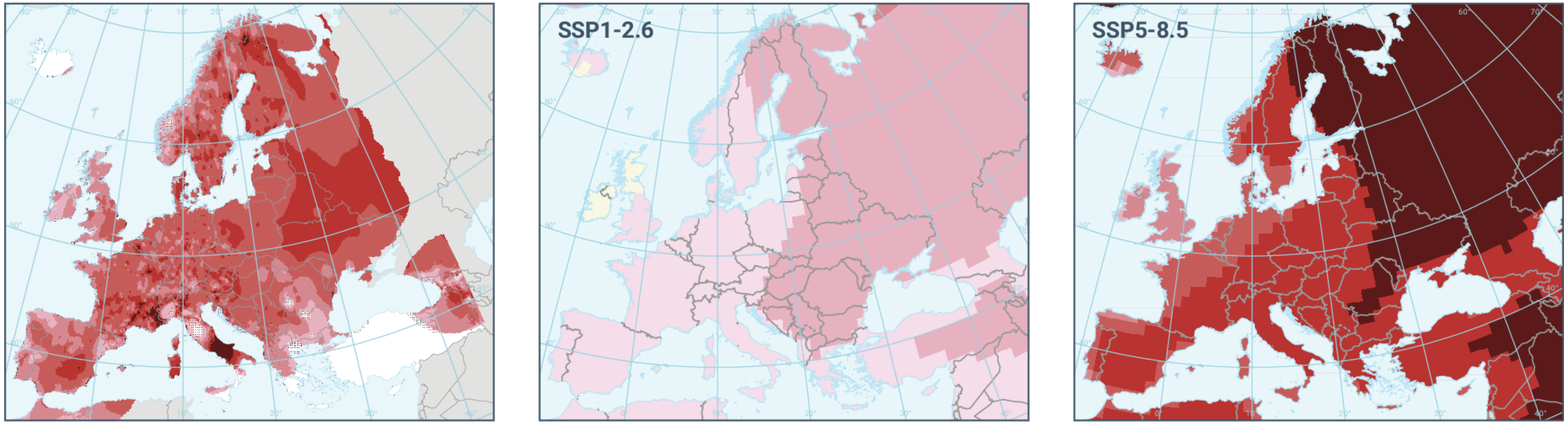


Source: EEA - https://www.eea.europa.eu/ims/global-and-european-temperatures

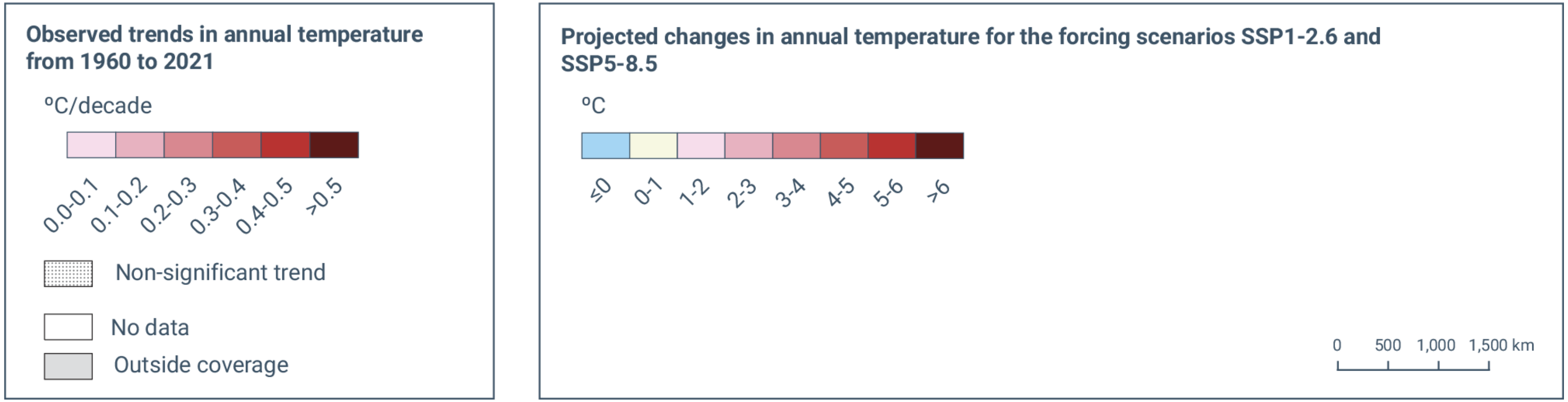


IPCC AR6 WG2 CH. 13.1.4 (2022)

Observed annual mean temperature trend (left panel) and projected 21st century temperature change under different scenarios (right panels)



Reference data: © EuroGeographics, © FAO (UN), © TurkStat Source: European Commission – Eurostat/GISCO



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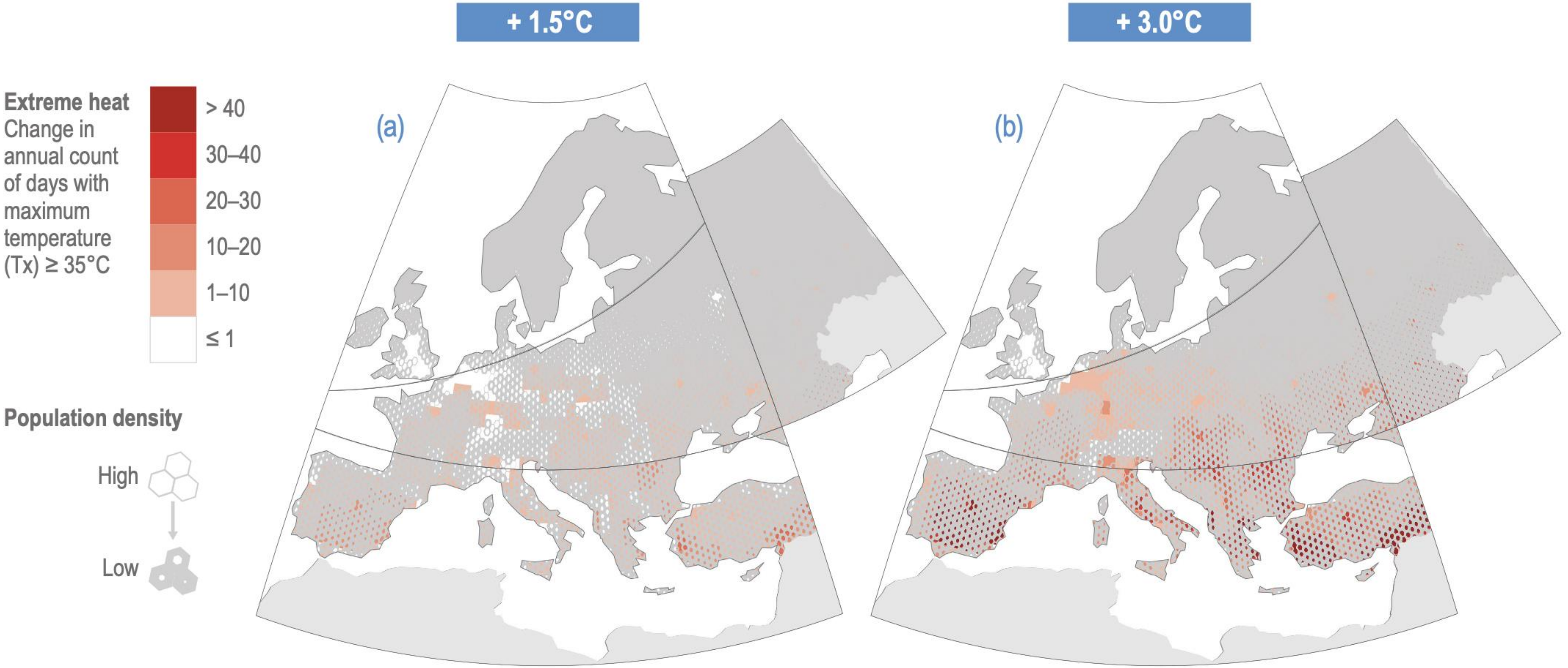
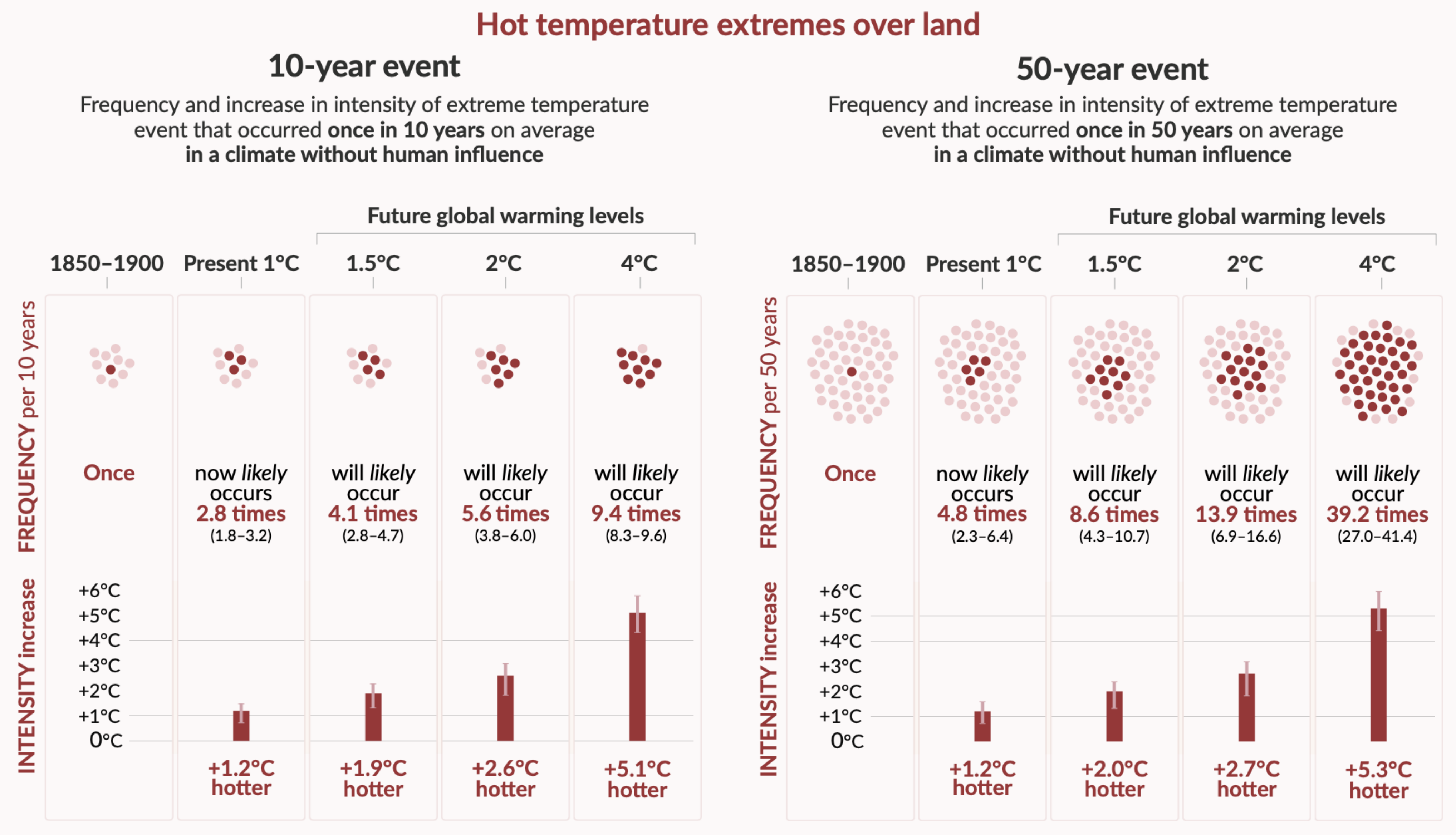


IPCC AR6 WG2 CH. 13.1.4 (2022)



Berkeley Earth, https://berkeleyearth.org

Projected heat stress risks for people in Europe (2040–2060)

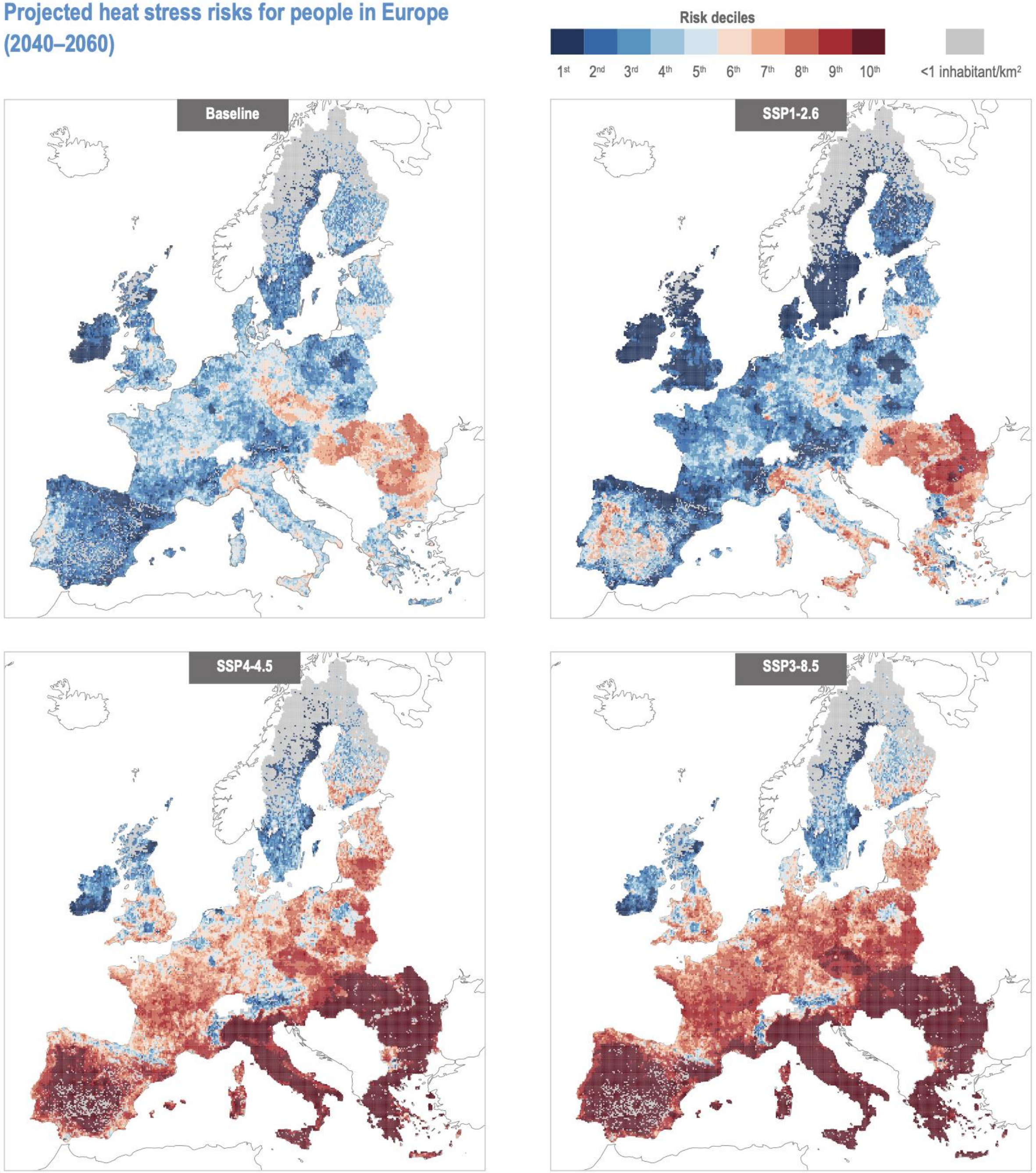
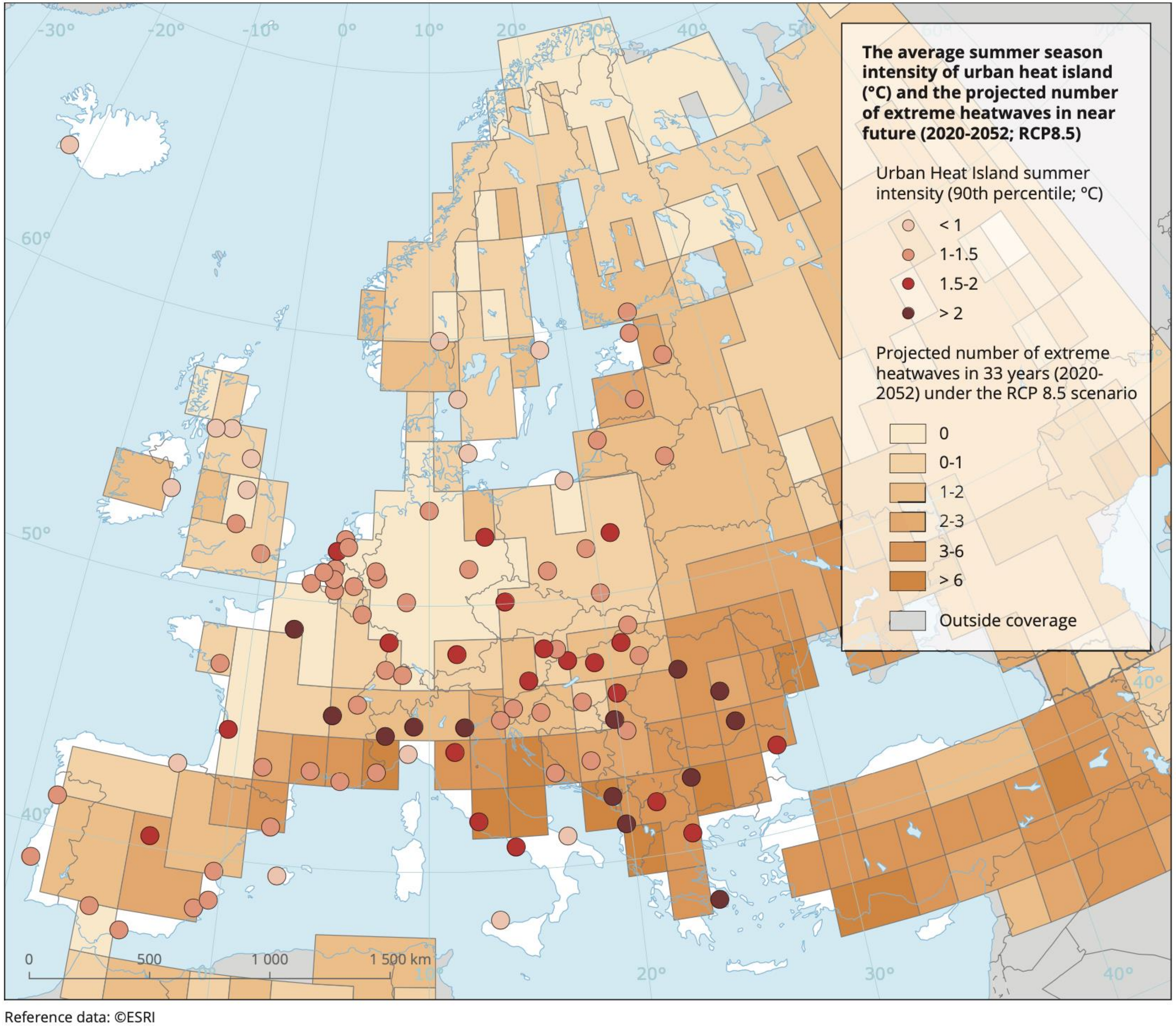


Figure 13.22 | Scenario matrix for multi-model median heat stress risks for the baseline 1986–2005, and different SSP–RCP combinations for the period 2040–2060. The SSPs are extended for Europe (EU28+). Heat stress risk is calculated by geometrical aggregation of the hazard (heatwave days), population vulnerability and exposure. Risk values are normalised using a z-score rescaling with a factor-10 shift. Details of the methodology are provided by Rohat et al. (2019).

IPCC AR6 WG2 CH. 13.1.4 (2022)



EEA, https://www.eea.europa.eu/data-and-maps/figures/the-average-summer-season-intensity

SUMMARY OF GLOBAL NUMBERS

Vulnerability	Time Period	Population Estimate	City Estimate
EXTREME HEAT	Present Day	Over 200 million people	Over 350 cities
	2050s	Over 1.6 billion people	Over 970 cities
EXTREME HEAT AND POVERTY	Present Day	Over 26 million people	Over 230 cities
	2050s	Nearly 215 million people	Over 490 cities
WATER AVAILABILITY	2050s	Over 650 million people	Over 500 cities
FOOD SECURITY	2050s	Over 2.5 billion people	Over 1,600 cities
SEA LEVEL RISE	2050s	Over 800 million people	Over 570 cities
SEA LEVEL RISE AND POWER PLANTS	2050s	Over 450 million people	Over 230 cities

Extreme Heat: The total number of people living in cities where they are regularly exposed to the hottest 3-month average maximum temperatures reaching at least 35°C (95°F) in the present day and in the 2050s.

Extreme Heat and Poverty: The total number of people living in poverty in cities where they are regularly exposed to the hottest 3-month average maximum temperatures reaching at least 35°C (95°F) in the present day and in the 2050s.

Water Availability: The total number of people living in cities where freshwater availability from stream-flow is projected to decline by at least 10 percent by the 2050s, compared to the present day.

Food Security: The total number of people living in cities where their national yield of at least one of four major crops (maize, rice, soy, or wheat) is projected to decline by at least 10 percent by the 2050s, compared to the present day.

Sea Level Rise: The number of people living in coastal cities where sea level is projected to rise by at least 0.5 metres by the 2050s compared to the present day. Coastal cities are defined as those within 10 kilometres from the coast and have an average elevation below 5 metres.

Sea Level Rise and Power Plants: The number of people living in cities where nearby power supply facilities within 50 kilometres of the city are projected to be vulnerable to 0.5 metres of sea level rise by the 2050s, compared to the present day. Coastal power plants are defined as those within 5 kilometres from the coast and have an average elevation below 5 metres.

The future we don‘t want, 2018

Today

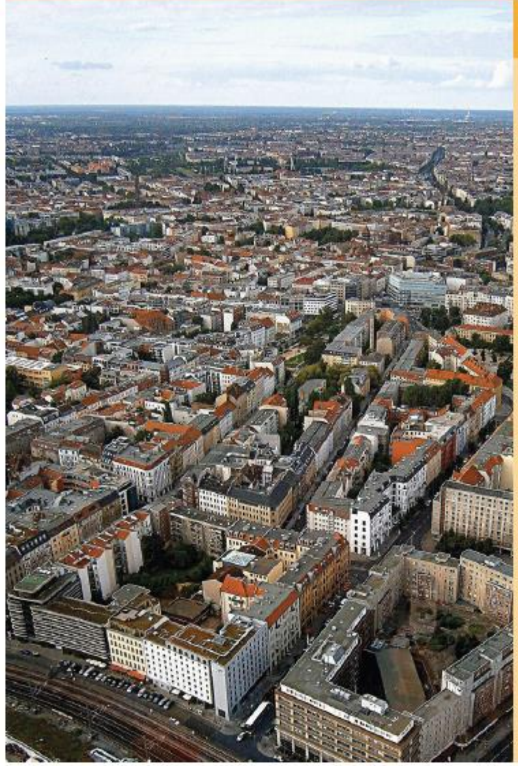
- Roughly 350 cities on earth experience extreme heat conditions in the form of 3-month average maximum temperatures reaching at least 35°C (95°F).
- Just over 200 million people in cities are living under extreme heat conditions.
- 14 percent of the global urban population lives under high heat conditions.

By the 2050s

- Over 970 cities will be regularly exposed to the hottest 3-month average maximum temperatures reaching at least 35°C (95°F).
- More than 1.6 billion people in cities will be living with extreme high summer temperatures.
- 45 percent of the global urban population will be living in cities with high summer temperatures.
- The number of people living in cities regularly exposed to heat extremes will increase by 700 percent compared to today.

Berlin, Germany

UCCRN City • C40 City • Global Covenant City



IMPACTS

ARC 3.2 Climate Projections – 2050s

Temperature	+1.3 to 3.6°C
Precipitation	-2 to +16 percent

- Days of extreme heat have become more common, leading to increased rates of mortality during intense heat waves.
- Rapid urbanisation and the growing number of elderly have increased the city's vulnerability to heat extremes.
- Heat-related mortality rates are particularly high in Berlin's most densely built-up districts.
- Extreme heat has also affected the transport system, for example, by making train carriages without proper ventilation too hot to use.

SOLUTIONS

- Berlin aims to become a 'Sponge City' that replaces hard surfaces with green space and water-permeable surfaces to combat the urban heat island effect as well as enable the city to adapt to heavy rains.
- By planting rooftops with mosses or grasses, the ability to absorb water increases while an evaporative cooling effect is achieved.
- Berlin has monitoring systems for climate change that aim to strengthen the resilience of ecosystems, public health and urban infrastructure.
- The city is working on improving communication to communities about upcoming risks and action.

Image Source: pixabay.com, CC0

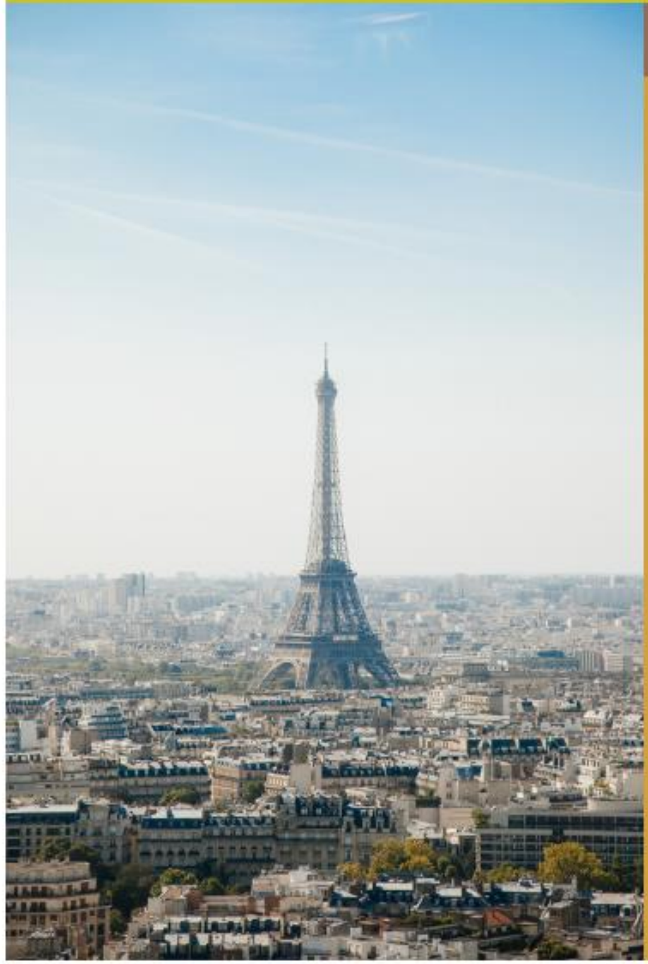
The future we don't want, 2018

By the 2050s

- **Around 2.5 billion people will be living in over 1,600 cities where national yields of a major crop are projected to decline by at least 10 percent below present-day levels.**

Paris, France

UCCRN City • C40 City • Global Covenant City



IMPACTS

ARC3.2 Climate Projections – 2050s

Temperature	+1.3 to 3.2°C
Precipitation	-6 to +8 percent

- Paris is susceptible to heat extremes and flooding.
- Over the coming decades, Paris expects greater competition for water sources in the North of France from other regions, as well as from agriculture and industry.
- The city aims to decrease its exposure to climate shocks, at home and abroad, and safeguard its long-term water supply while reducing agricultural emissions.

SOLUTIONS

- Paris engaged external experts in a year-long survey to assess its vulnerabilities and opportunities with regard to climate change and resources depletion (water, energy, food, biodiversity).
- Paris aims to use its procurement more strategically to influence food security and sustainable agriculture while reducing emissions.
- The city has established low-cost markets for locally grown, organic produce.
- Paris plans to establish 33 hectares of urban agriculture within the city's boundaries by 2020. By 2050, 25 percent of the city's food supply will be produced in the Île-de-France region.

Image Source: Photo by Anthony DELANOIX on Unsplash

The future we don't want, 2018

Heat-related climate risks and adaptation in central EU

Notes: The figure shows risk as a function of climate hazards, exposure and vulnerability. Adaptation and mitigation actions can modify hazards, while adaptation actions can also reduce exposure and vulnerability.

Source: Abram *et al.* (2019)

Adaptation Gap Report 2022: Too Little, Too Slow (2022)

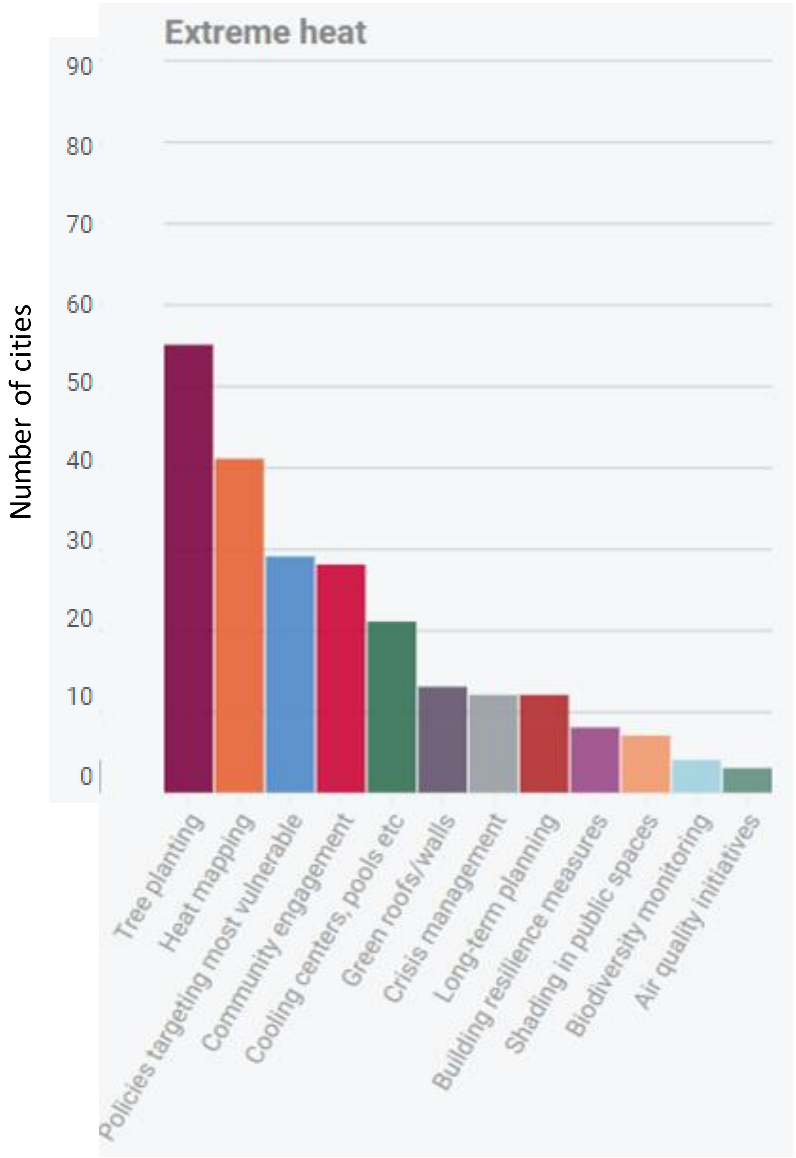


Table 3.3 Dealing with climate change challenges: examples of incremental and transformational approaches

Challenge / Approach	Incremental measures: optimising conventional measures	Transformational measures: dealing with the challenge in a different way
Heat	Improve air conditioning	Change city design: cooling by greening and ventilation corridors Change building design: passively cooling by isolation, shadowing, natural ventilation Change behaviour: work in the cooler hours, stay in cool places, drink more water, slow down physical activity
Water scarcity and droughts	Serve the demand by getting water from distant regions Water rationing Reduce leakages	Reduce the demand by water-saving appliances in households and buildings Reuse water Establish water-saving behaviours Change production using less water
Various	Improve existing governance and behaviour	Changed governance; consumption, behaviour etc.

EEA: Urban adaptation in Europe, 2020

https://climate-adapt.eea.europa.eu/en/knowledge/tools/urban-adaptation

The project follows a 'living laboratory' approach and collects information on heat adaptation measures through thermal building simulations, expert and participatory workshops, and resident surveys, which will direct the implementation of measures. According to face-to-face surveys, three-quarters of interviewees considered sun protection on housing exteriors, such as jalousies and roller shutters as the most effective measure against heat stress. Other preferred measures for individual flats were curtains and planting of trees in front of the building. Regarding adaptation measures in the broader urban environment, around 80 % of respondents perceived shaded seating areas as useful. Air-conditioned public transport, shaded stations and bus stops, and greening streets were also largely rated as beneficial.

In 2019, the housing association Eisenbahner-Wohnungsbaugenossenschaft Dresden upgraded three 1980s apartment blocks. Based on the survey results, the following measures were implemented:

- external shutters and new windows;
- roof insulation;
- improved night ventilation by increasing the exhaust capacity in bathrooms.

Post implementation assessment found that while the individual measures had little effect on heat stress, they had a considerable effect when combined. Moreover, the behaviour of residents was found to be a key factor in regulating heat stress, as use of shading and night ventilation were shown to substantially reduce temperatures.

Residential buildings before (2018) and after renovation (2019) © S. Kunze, HTW Dresden

Sources: Personal communication from Janneke Westermann, Leibniz-Institut für ökologische Raumentwicklung (IÖR), 2019; Ortlepp and Schiela (2019); Baldin and Sinning (2019).

1 New locks in Albertkanaal in Flanders, Belgium

2 Barcelona trees tempering the Mediterranean city climate, Spain

3 Green roofs in Basel, Switzerland: combining mitigation and adaptation measures

4 The economics of managing heavy rains and stormwater in Copenhagen - The Cloudburst Management Plan, Denmark

5 Financial contributions of planning applications to prevent heathland fires in Dorset, United Kingdom

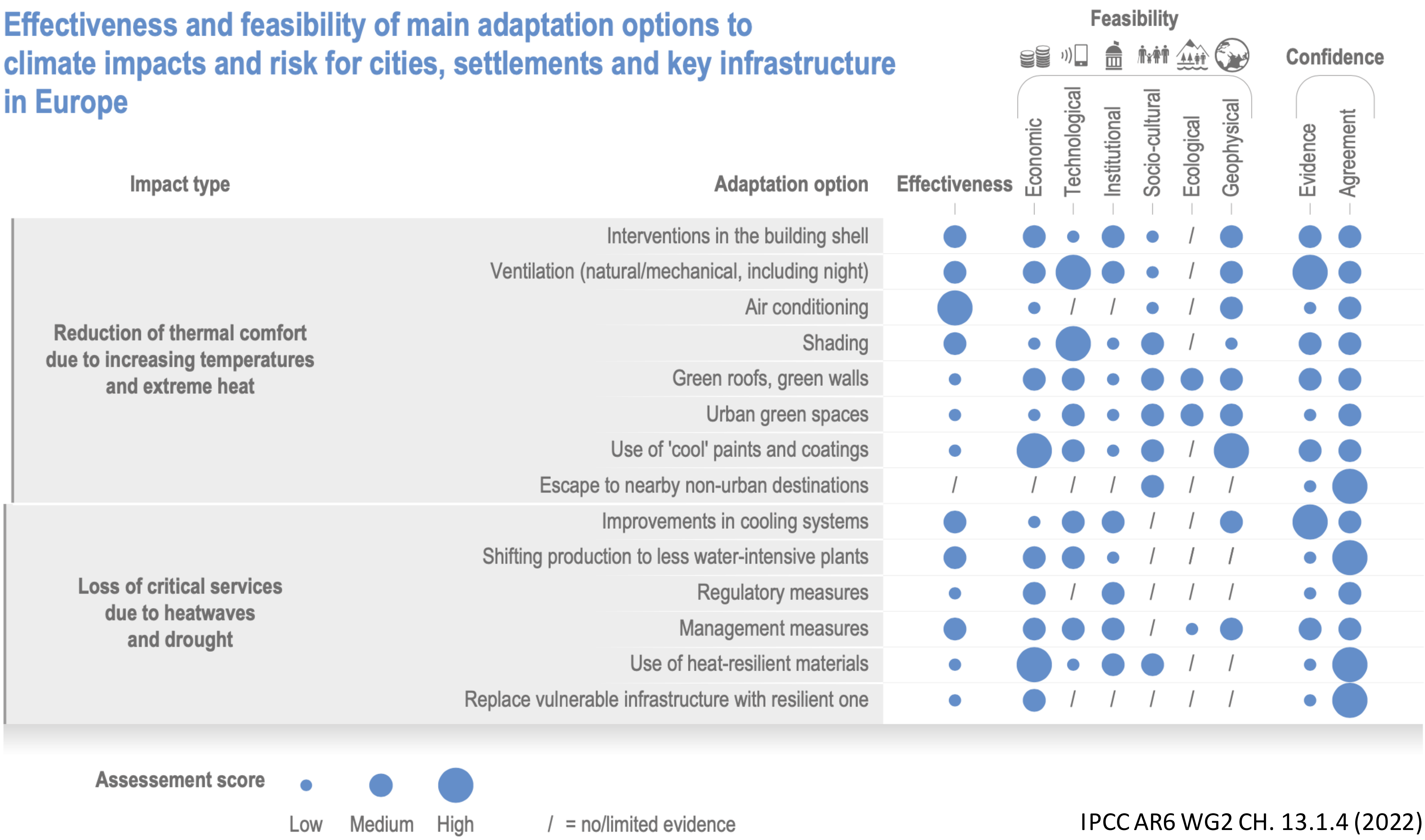
6 Implementation of the Heat-Health Action Plan of the former Yugoslav Republic of Macedonia

7 A transboundary depoldered area for flood protection and nature: Hedwige and Prosper Polders, Belgium

8 Tamera water retention landscape to restore the water cycle and reduce vulnerability to droughts, Portugal

9 Timmendorfer Strand coastal flood defence strategy, Germany

10 Temporary flood water storage in agricultural areas in the Middle Tisza river basin, Hungary



IPCC AR6 WG2 CH. 13.1.4 (2022)

Figure 13.20 | Effectiveness and feasibility of the main adaptation options for cities, settlements and key infrastructures in Europe (Section SM13.9; Table SM13.8)

Bilbao - NBS for dealing with extreme temperature and rainfall events

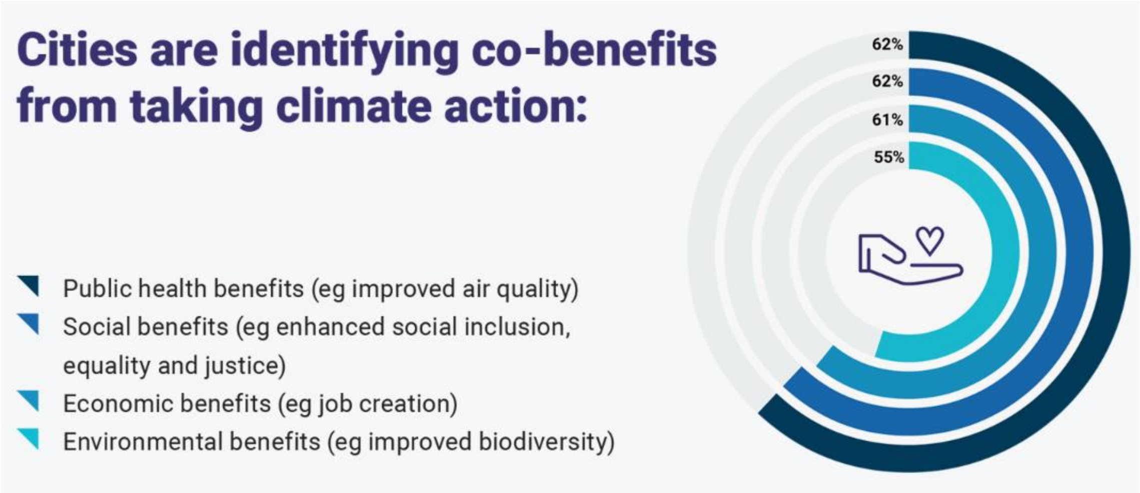
Actions:

NBS1 - Zorrotzaurre project - The Zorrotzaurre project is an urban renewal project to promote the sustainable restoration of a currently derelict site in the Zorrotzaurre peninsula, northwest of the city centre. The plan is to create a new quarter that is well-connected to the rest of the city, with affordable housing, environmentally-friendly business areas, social and cultural facilities, and spacious green areas for recreation. The Master Plan was designed by the architect Zaha Hadid, and includes the conversion of the current Zorrotzaurre peninsula into an island by opening up the Deusto Canal. The plan foresees a total surface of 673 000 m2 and includes flood prevention measures, a transport network, and restoration of the area's cultural heritage.

NBS2 – Bilbao Greenbelt Expansion - The Bilbao Greenbelt project aims to expand and connect the city's green areas. It has already led to 1 million extra square metres of green areas in Bilbao in the last 10 years. The project aims to create a network linking the peripheral green belt with urban parks and other green areas inside the city.

ADAPTATION nature based solutions: https://oppla.eu/nbs/case-studies

Figure 6.2 Co-benefits of adaptation actions



https://www.cdp.net/en/research/global-reports/protecting-people-and-the-planet

EEA: Urban adaptation in Europe, 2020

Note: As reported to CDP by 106 cities from 24 EEA member and collaborating countries and the United Kingdom for 220 adaptation actions.

Heatwave guide for cities (2019)

POLICY RECOMMENDATIONS:

» Heatwaves are a clear and rising threat around the world. Find out if heatwaves are considered a disaster under your national disaster laws. If they are included, emergency disaster relief funding may be applicable when a heatwave occurs. If not, materials from this guide may help you to advocate for the inclusion of extreme heat in your national disaster laws.

» Women and men will be differently and disproportionately affected by heatwaves. This requires gender-based risk and vulnerability assessments and risk planning.

» Different parts of the same city may witness heat waves with different thresholds depending on the local land use pattern and extent of vulnerability and exposure of the people living in different settlements. Heat-related policies must take this into account.

NEXT STEPS:

» Contact your local meteorological office for information on how climate change is affecting your city.

» Locate heat-health studies for your region. If they do not exist, commission them. Ask universities in your city to study this topic.

» Consider developing a heat island map, in order to identify which parts of your city are typically the hottest due to the built environment.

VULNERABLE POPULATION	RISK FACTORS
Adults over 65	Less aware and adaptable to extreme heat
Individuals with chronic medical conditions	These include heart disease, lung and kidney conditions and mental illness. Those taking medications that can worsen the impact of extreme heat are especially vulnerable
Children under five years old	Sensitive to the effects of extreme heat and must rely on others to keep them cool and hydrated
Women and girls	May not have access to a variety of media, sleep in ill ventilated rooms, lack private bathing space, especially during menstruation.
Pregnant and lactating women	Pregnant women are more likely to go into early labour in the week following a heatwave. This risk goes up with more consecutive days of extreme heat.[18] Lactating women require more drinking water as breastfeeding is extremely dehydrating
Outdoor workers (inlc. traffic police and security guards)	Often engaged in strenuous labour while directly exposed to sunlight as well as heat and air pollution. More likely to become dehydrated and suffer from heat-related illness.
People living alone	May not access help quickly
Individuals with disabilities	May not be able to access help quickly
Overweight and obese individuals	May be more sensitive to extreme heat and have difficulty thermoregulating
Individuals of low socio-economic status	May not have access to clean drinking water and other cooling measures. May not be able to access information about heatwaves and cooling centres
Migrants and refugees	May not have access to current information about heat advisories and health risks, or may experience heat conditions that are different to their place of origin
Homeless people	May not receive warning messages, may be unaware of cooling centres and may have limited access to other cooling measures (e.g. cool showers or baths)
Individuals unable to read and non-native language speakers	Cannot read current information about heat advisories and health risks. Non-native language speakers also may not be able to understand advisories broadcast on TV and radio.
Tourists	May not be able to understand advisories in local languages. May not know how to access cooling centres, green spaces or other resources, including emergency management systems. May be from cooler climates and less adapted to the heat.
Animals/pets	Dependent on owner for adequate protection from heat

Adapted from the Kansas Extreme Heat Toolkit.[19]

ILLNESS	SYMPTOMS	CAUSE	FIRST AID ACTION
Heat cramps	Muscle cramps, often following exercise	Dehydration and loss of electrolytes	Move to a cooler place, drink fluids with electrolytes* (i.e. sports drinks)
Heat rash	Patches of small, red, itchy bumps, spots or blisters	Sweat glands are blocked and the sweat cannot get to the surface of the skin to evaporate	Move to a cooler, less humid place
Heat oedema	Swelling of hands or ankles/feet	Heat causes a widening of blood vessels and blood pools in the extremities	Move to a cooler place, elevate swollen extremities
Heat syncope	Dizziness and fainting	Drop in blood pressure due to dehydration and/ or a widening of blood vessels	Move to a cooler place, hydrate with electrolytes
Heat exhaustion	Discomfort, vomiting, circulatory collapse, core temperature of 37–40°C	Dehydration and/or sodium depletion	Move to a cooler place, seek medical attention, hydrate with electrolytes. If untreated can lead to heat stroke
Heat stroke	Confusion, disorientation, unconsciousness, hot dry skin, core temperature exceeding 40°C for between 45 minutes and 8 hours	Body's temperature control system fails. Can be caused by heat exposure or physical exertion	MEDICAL EMERGENCY Move to a cooler place, remove excess clothing and seek medical treatment immediately. Use ice packs or cool body temperature by whatever means available. Then give fluids to replace those lost.

Heat warning messages must be tested for understanding before they are issued to the public.

NEXT STEPS:

» Pre-develop some standard heatwave messages for the residents of your city on heat risks, services that residents can access to reduce their risk and individual action they can take. These can be used as part of a press release or information campaign during a heatwave.

Heatwave guide for cities (2019)

» **ACTIONS TO REDUCE HEAT IMPACTS SHOULD BE IMPLEMENTED AT INDIVIDUAL AND CITY LEVEL.**

» **CITY-LEVEL ACTIONS REQUIRE CLOSE COORDINATION WITH VARIOUS ACTORS TO MINIMIZE HEAT IMPACTS.**

Move to a cool part of the house, close and cover windows facing the sun during the day and open them at night. Cool off with a cold bath, shower or sprinkle of water. Wear loose fitting, lightweight, and light-coloured clothes and a sun hat.

Drink plenty of water, without waiting to feel thirsty. Avoid alcohol and caffeine.

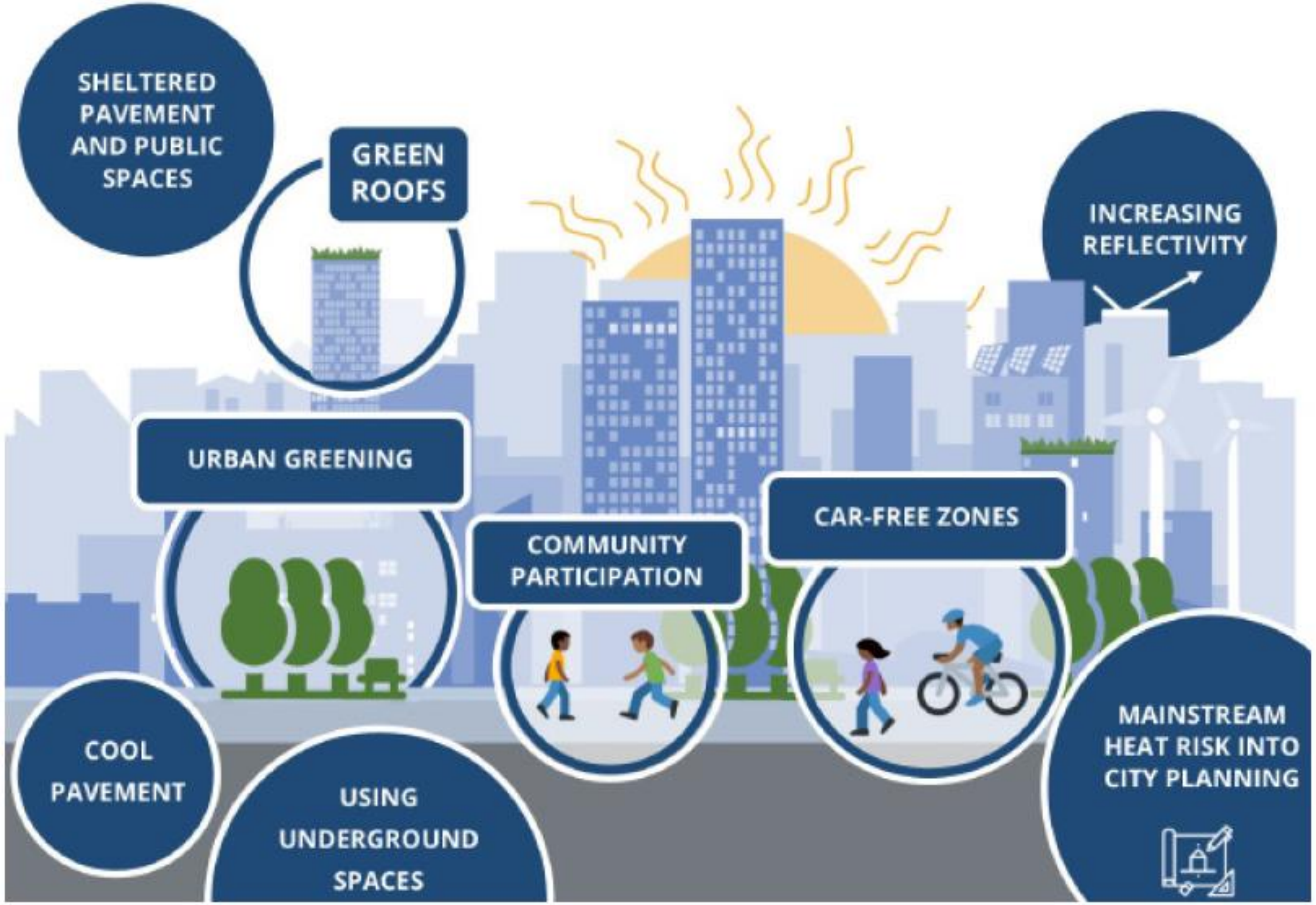
Contact family and friends, especially older people, to ensure they are keeping hydrated and cool. Do not leave family members (especially infants and pets) in a parked, closed vehicle.

Walk and rest in shady areas. Minimize or completely avoid high-energy physical activities. If you work outside, take frequent breaks or reschedule work to cooler parts of the day, if possible.

Limit outdoor activity, including after-school sports.

Individuals can help save lives by ensuring neighbors, family, and friends who are older, chronically ill and otherwise vulnerable to heat, have sufficient access to water and cooling.

Heatwave guide for cities (2019)



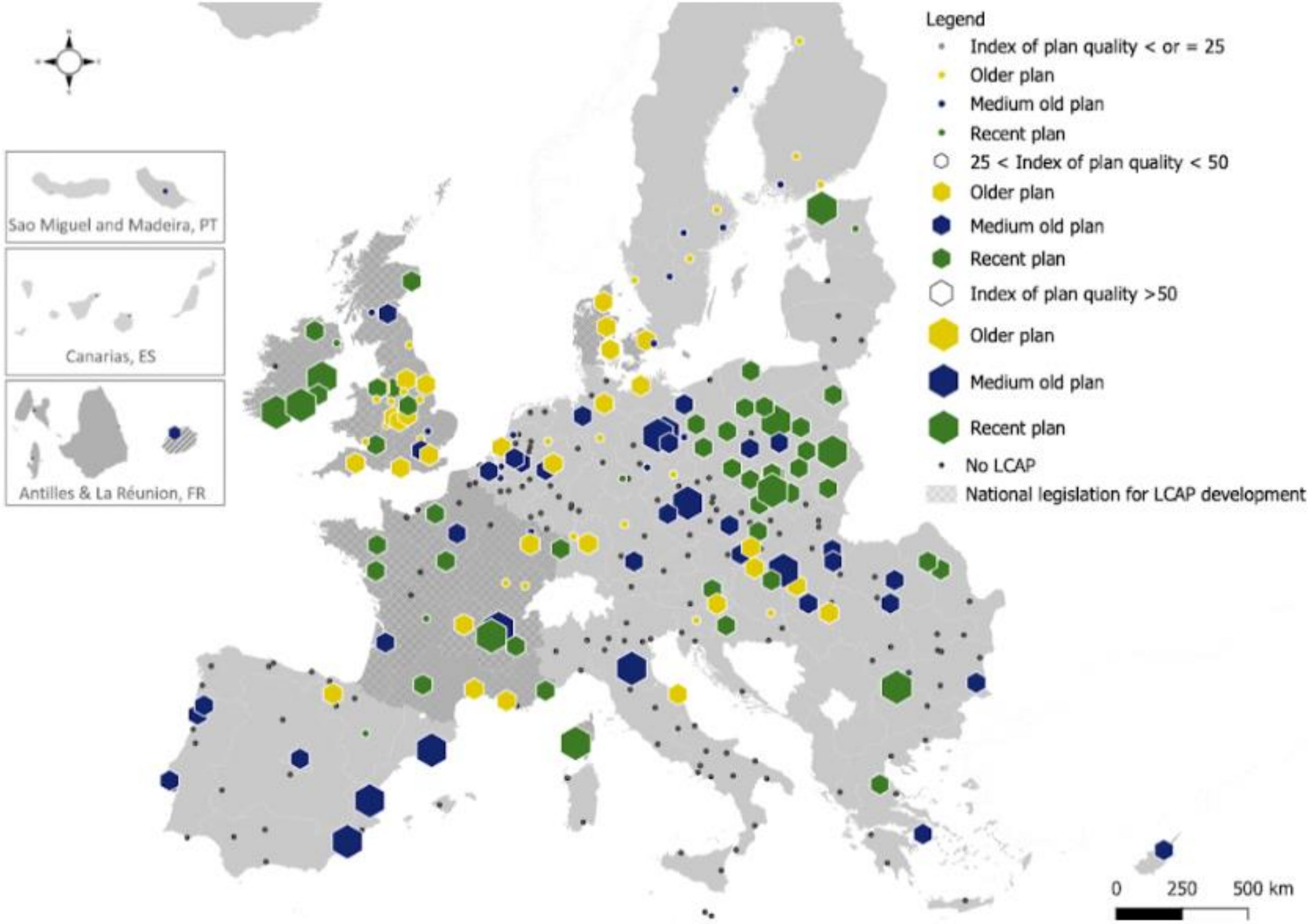
Urban planning measures that can contribute to a long-term heat-reduction strategy.

Heatwave guide for cities (2019)

Box 5.1 Synthesis of principles for best adaptation practice

- Genuine inclusion of stakeholders, local communities, women and marginalized groups (e.g. indigenous peoples) into decision-making and co-development of adaptation planning and implementation to reflect differing values, perspectives and interests and produce equitable, fair and just adaptation outcomes
- Transparency, accountability and predictability of support and integration of adaptation into national development priorities, strategies and the SDGs
- Flexible programming and adaptative management of implementation to consider feedback and learnings and to enhance efficiencies
- Investment in local capabilities, capacity-building and democratic governance structures in support of climate risk management and empowerment for long-term sustainability
- Consideration of future risks including climate trajectories and uncertainties to minimize unintended consequences and maladaptation, while enhancing adaptation ambition
- Integration of local, traditional, indigenous and scientific knowledge into design, implementation and monitoring and evaluation to enhance buy-in and ownership
- Tackling inequalities and structural drivers of vulnerability in addition to reducing exposure and/or vulnerabilities to climate hazards to embark on climate-resilient development pathways

Adaptation Gap Report 2022: Too Little, Too Slow (2022)



Map of European cities with urban climate adaptation plans and their quality score. The quality of the plan is shown by the size of the hexagon. Colours refer to the age of the plan, from before mid-2015 (yellow), to between mid-2015 and mid-2018 (blue) and after mid-2018 (green). Cities in our sample without an adaptation plan are shown by grey dots. Hatched countries have national legislation that requires cities to develop urban climate adaptation plans (France, the UK, Ireland and Denmark). Source: Reckien et al. (2023).

Ultimately, the effectiveness of adaptation will only be demonstrated through long-term trajectories of human and ecological well-being, and the extent to which the SDGs and related outcomes are achieved in the face of climate change

Adaptation Gap Report 2022: Too Little, Too Slow (2022)

Links to adaptation studies:

- adaptation case study explorer: https://climate-adapt.eea.europa.eu/en/knowledge/tools/case-study-explorer
- Climate adapt Case studies: https://climate-adapt.eea.europa.eu/en/data-and-downloads/
- A few examples of adaptation in cities: https://www.cdp.net/en/cities/cities-case-studies
- nature based solutions: https://unalab.eu/system/files/2022-11/unalab-nbs-technical-handbook-factsheets2022-11-17.pdf
- Urban adaptation support tool: https://climate-adapt.eea.europa.eu/en/knowledge//tools/urban-ast/step-2-3
- Heatwave guide for cities https://www.climatecentre.org/downloads/files/IFRCGeneva/RCCC%20Heatwave%20Guide%202019%20A4%20RR%20ONLINE%20copy.pdf
- RCVA assesment and adaptation case study for the city of Belgrade (Serbia): https://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

Climate risk and vulnerability assessment - Training guide for cities, CDP 2022. https://cdn.cdp.net/cdp-production/comfy/cms/files/files/000/006/058/original/CDP_Resourcepack.pdf

Bednar-Friedl, B., R. Biesbroek, D.N. Schmidt, P. Alexander, K.Y. Børsheim, J. Carnicer, E. Georgopoulou, M. Haasnoot, G. Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D. Piepenburg, and L. Whitmarsh, 2022: Europe. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1817–1927, doi:10.1017/9781009325844.015.

The future we don‘t want, 2018. https://www.c40.org/what-we-do/scaling-up-climate-action/adaptation-water/the-future-we-dont-want/

EEA: Urban adaptation in Europe, 2020. https://www.eea.europa.eu/publications/urban-adaptation-in-europe

UNEP too little, too slow: Adaptation Gap Report 2022

Climate risks	Adaptation	Effectiveness outcomes (positive, negative, neutral, mixed, insufficient evidence)				Mitigation	Context specificity	Adaptation adequacy and limits
		For vulnerable people	For at-risk ecosystems	For goals of equity, gender justice	Over time			
Heat, heatwaves	Heat action plans in North America	Mostly positive	Insufficient evidence, potential for modest or positive	Mixed	Positive	Mixed	The efficacy of heat alerts depends on targeting vulnerable populations, support for action, behaviour change and local climate conditions. Urban greening is broadly effective but contextual (e.g. greening parking lots is more effective in high-rises than green roofs on low-rise buildings). Air conditioning is consistently and highly effective in reducing mortality across contexts.	Benefits of typical actions in heat action plans (e.g. urban greening, early warnings) may become insufficient unless they are widespread and extensive and combined with changes in labour laws, building codes and transformative urban planning. Air conditioning is highly effective, even at very high temperatures, though incurs substantial and potentially prohibitive cost, equity and mitigation trade-offs.
	Flood risk management in Western and Central Europe	Mixed	Mixed	Mixed	Mixed	Mixed	Effectiveness depends on geographical location, type of flood hazard, people exposed, prior investments in adaptation and current levels of vulnerability.	Damages can be significantly reduced even at higher warming (2–4°C) if high levels of adaptation are implemented. However, even when multiple